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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VIII
999 18th STREET - SUITE 500
DENVER, COLORADO 80202-2466

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WATER QUALITY DIVISION
WYOMING

Mr. Dennis Hemmer, Director
Wyoming Department of Environmental Quality
Herschler Building
122 West 25th Street
Cheyenne, WY 82002

RE: Approval of the Non-Significant Revision of the State of Wyoming, Underground Injection Control Program Comprised by the Aquifer Exemption of the Minnelusa Formation underlying Portions of Campbell County, WY.

Dear Mr. Hemmer:

The Environmental Protection Agency (EPA) has reviewed the request for a revision of the State of Wyoming Underground Injection Control (UIC) program comprised of an areal aquifer exemption of the Minnelusa Formation underlying portions of Campbell County, WY. The EPA Office of Water has determined that this modification is a "non-substantial" program revision, which can be approved by Region VIII. Because this modification is a "non-substantial" revision, it requires no additional public notice beyond the 45 day public notice that was published previously by the State of Wyoming from August 10 through September 29, 1995.

The exemption of the Minnelusa Formation underlying the following areas is approved by EPA, Region VIII:

- T46N through T53N by R69W through R72W
- T45N by R71W
- T49N by R73W & R74W
- T54N through T55N by R71W through R72W, and
- T49N through T51N by R68W

Please note that the exempted area *does not* include the area encompassing T58N through T56N by R71W through R72W that was included in the original aquifer exemption request. The Region did not approve this northern portion of the requested exemption area for two reasons. The first reason is the impact on the Minnelusa Formation caused by the Black Hills uplift. This uplift has caused the Minnelusa Formation to occur at a shallower depth within the northern and northeastern portion of the requested exemption area and contain lower Total Dissolved Solids (TDS) in the formation water than is found in deeper portions of the exemption area. Wells located in T54N and T55N within the proposed exemption area have TDS values below 5,000 mg/l. Given the fact that no water quality data is available in T56N through T58N within the proposed exemption area, the determination cannot be made with certainty that the Minnelusa Formation in this area will not reasonably be expected to be able to supply public drinking water. The second reason is that Region VIII believes that exempting a portion of the aquifer up to the Montana State boundary would impact that State's regulatory jurisdiction. "Boundary issues" present unique regulatory challenges, and Region VIII believes that any aquifer exemption requests in an area involving boundary issues are best regulated on an individual, rather than

general, basis.

EPA Region VIII concurs with the State's determination that reclassifies water in the designated portions of the Minnelusa Formation as Class VI Groundwater of the State that is unusable or unsuitable for use:

- (a) Due to excessive concentration of TDS; or
- (b) Is so contaminated that it would be economically or technologically impractical to make the water useable; or
- (c) Is located in such a way, including depth below the surface, so as to make use economically and technologically impractical.

CRITERIA FOR AN EXEMPTED AQUIFER:

UIC regulations found at 40 CFR 146.4 state that an aquifer or a portion thereof which meets the definition for an "underground source of drinking water" in 146.3 may be determined to be an "exempted aquifer" if it meets the following criteria:

- (a) It does not currently serve as a source of drinking water; and
- (b) It cannot now and will not in the future serve as a source of drinking water because:
 - (1) It is mineral, hydrocarbon or geothermal energy producing ...
 - (3) It is so contaminated that it would be economically or technologically impractical to render the water fit for human consumption; or
- (c) The total dissolved solids content of the ground water is more than 3,000 mg/l and less than 10,000 mg/l and it is not reasonably expected to supply a public water system.

BASIS FOR EXEMPTION

It Does Not Currently Serve As A Source Of Drinking Water:

The State has provided documentation that there are no developed water wells in the Minnelusa Formation within the area requested for exemption.

It Cannot Now And Will Not In The Future Serve As A Source Of Drinking Water Because It Is Mineral, Hydrocarbon Or Geothermal Energy Producing... :

The Powder River Basin has been exploited for oil and gas production for over fifty years. Although there are many oil and gas producing formations in the basin, one of the more prolific oil producing zones in the basin has been the Minnelusa Formation. The Minnelusa Formation is known to be hydrocarbon bearing in most parts of the proposed exemption area, and in many areas is actively producing hydrocarbons. The public notice provided by the State discussed this fact, and stated that several sources of information were used for making that determination.

It Cannot Now And Will Not In The Future Serve As A Source Of Drinking Water Because It Is So Contaminated That It Would Be Economically Or Technologically Impractical To Render The Water Fit For Human Consumption:

The State provided supporting information for the proposed action indicating that development of the Minnelusa Formation as a source of treated drinking water could be reasonably concluded to be technically and economically impractical, considering the relative

depth of the source, the low water producing capability, and the presence of hydrocarbons in the water. The State provided a cost estimate for producing and treating Minnelusa Formation water for human consumption, including the estimated costs for developing a municipal water supply well using the Minnelusa Formation. Other regional aquifers, the Madison Formation for example, appear to be better suited for development as a source of drinking water due to higher producing capability, significantly better water quality, and lower water treatment costs. The State concluded that the high capitalization costs combined with high cost for ongoing water treatment, including removal of hydrocarbons found in the Minnelusa Formation water, are extremely expensive compared with other options available in the area.

It Cannot Now And Will Not In The Future Serve As A Source Of Drinking Water Because The Total Dissolved Solids Content Of The Ground Water Is More Than 3,000 Mg/l And Less Than 10,000 Mg/l And It Is Not Reasonably Expected To Supply A Public Water System.

Chemical analyses of the fluids found in Minnelusa Formation provided in *Chemical Analyses of Water from the Minnelusa Formation and Equivalents in the Powder River Basin and Adjacent areas, Northeastern Wyoming*, (prepared by the U.S. Geological Survey (USGS), published by the Wyoming Water Planning Program, Report No. 18, 1979) indicate the Minnelusa Formation in the deeper southern portion of the proposed exemption area contains waters of high TDS, generally in excess of 10,000 milligrams per liter (mg/l). An aquifer exemption is, therefore, not explicitly required in these areas. Where sampling results are available in the north and northeastern portion of the proposed exemption area, there is a decrease in TDS to below 5,000 mg/l, and, thus, an exemption is required prior to allowing use of the Minnelusa Formation for the injection of brine fluids in this area. Region VIII notes that the data in this portion of the requested exemption area shows a general trend toward lower TDS content in Minnelusa Formation water in the northern and northeastern portion of the requested exemption area due to the effect of the Black Hills uplift, as discussed previously.

There is some variability in the TDS analyses included in the USGS Report, showing TDS values below 3,000 mg/l in wells adjacent to wells completed within the same unit having TDS values an order of magnitude higher. In its response to that concern, the State interpreted those results to be due to dilution by fresh water drilling mud contamination during drill stem tests. The State noted that it is highly implausible that 2,840 mg/l and 58,500 mg/l TDS waters would coexist in the same aquifer within the same 40 acre parcel, and concluded it was probable that actual TDS was higher and the water quality poorer than the sampling results indicated.

CONDITIONS OF APPROVAL

Therefore, the portion of the Minnelusa Formation designated in the second paragraph is approved as an exempted aquifer for the purpose of injection of commercial disposal of non-hazardous fluids and oil field brines through injection wells permitted by the Wyoming Department of Environmental Quality, Water Quality Division, UIC Program. The specific injectate constituents will vary with each permit application, but will be subjected to public comment and Region VIII review, and will be restricted at the discretion of the Wyoming UIC Program.

The injection zone within the exemption areas is confined vertically by 4,500 to 5,700 feet of interburden occurring between the injection zone and the deepest formation currently serving

as a source of drinking water. Within that interval lies the Pierre Shale, with a thickness of 2000 feet, and the Opeche Shale, the basal member of the Goose Egg Formation, which directly overlies the injection zone. The Opeche Shale is considered to be a effective impervious barrier to fluid movement, thus confining the underlying strata. The Goose Egg Formation, 200 to 400 feet in thickness, is considered to be an effective aquitard within the exemption area.

If you have any questions concerning this matter, please call Valois Shea-Albin at (303) 312-6276.

Sincerely,



Kerrigan G. Clough
Assistance Regional Administrator,
Office of Pollution Prevention,
State and Tribal Assistance

cc: Robert Lucht, Supervisor, UIC Program
Mario Salazar, OGWDW

Don Olson, OECA
Bruce Kobelski, OGWDW